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"Our" Five-year Plan

It is essential to note that what we propose to write is "our" five-year plan for the future conduct of the ironfoundry industry, and it is not inspired in any way by the recent meeting held at the Dorchester Hotel, at which we were not present. The speeches at the luncheon have, however, provided us with a general background as to what is in the minds of the present leaders of thought in the industry. Thus, then, to our mind these are the fundamentals for the success of any plan for the modernisation of this branch of industry.

(1) Every endeavour must be made to make every shop in which castings are made really well lighted, well ventilated and as clean and tidy as possible; in short, to ensure that all workshops are worthy in every respect of a great national industry. Special attention must be paid to the dust problem. (2) A unified plan must be established to ensure adequate recruitment and the proper training of trade lads and the technical staff of the industry. The various schemes now operating must be examined and the best ones discovered must be standardised nationally. (3) As probably 95 per cent. of the financial failures in the industry are due to lack of fundamental knowledge of costing, help must be given to the smaller concerns to prevent them from committing industrial suicide. (4) The foundries should deposit with their appropriate association a list of types of castings they make so that steps can be taken to ensure technical co-operation amongst manufacturers of similar articles. We notice that the 1940 year-book of the French foundry employers' federation carries 75 such headings with many sub-divisions. (5) The industry could not do better than emulate France's lead by adding 1 per cent. to all invoices, the revenue so obtained to be divided equally between co-operative and internal research. We would like to see an early attack to be made on the sand deposits of this country to ascertain which, if any, contain the noxious mineral which brings in its train pulmonary diseases. It is well known in coal mining that certain pits are unhealthy due to this very cause, whilst others are totally free from trouble. The Sahara seems to be immune! The present rather intangible bogie needs laying. (6) Whilst some foundry owners are worried about current political tendencies, we feel strongly that the appropriate policy to adopt is to make each firm, shop and section as efficient as possible. Under modern conditions this implies co-operation with the rest of the industry. If in the dim and distant future all industry be nationalised, then the heads of efficiently-run enterprises will have every chance of being appointed general managers at salaries probably in excess of those now earned as owners! In many doctors' waiting rooms there is a printed slogan, "Don't worry. It may not happen."

Obviously, to carry out our plan there is need for a strong—really a 100 per cent.—employers' federation. The structure so patiently built up is now well established on a firm foundation, with but a few loose ends to tie up. For every one of the six points we have enumerated, employer collaboration is useful if not essential. In the modernisation of shops, which embraces, of course, the factory regulations, a committee is being, or has been, set up—the Ministry of Labour and National Service keeps this information on its secret list—to investigate existing conditions and to suggest means for amelioration. Next, under the heading of recruitment, action on the widest basis has to be taken to ensure that the industry gets its fair share of demobilised Service men and women. Points three to five specifically relate to organised activities and call for no further comment, whilst, as for the implications of No. 6, the existence of a well-organised employers' federation will go far to ensure general equity in any general winding-up order the industry may receive!

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FORTHCOMING EVENTS

(Secretaries are invited to send in notices of meetings, etc., for inclusion in this column.)

OCTOBER 12.

Institute of Welding (Birmingham branch):—"Developments in the Welding of Aluminium Alloys," by Dr. E. G. West. At the James Watt Memorial Institute, Gt. Charles Street, Birmingham, at 6.30 p.m.

Institution of Mechanical Engineers:—"The Mechanism of the German Rocket Bomb (V2)," by W. G. A. Perring. At Storey's Gate, St. James's Park, London, S.W.1, at 5.30 p.m.

OCTOBER 16.

British Society for International Bibliography:—Presidential address, "Fifty Years of International Documentation," by Dr. S. C. Bradford. Discussion on the "Technique of Making Abstracts of Scientific and Technical Papers." At the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2 at 2.30 p.m.

OCTOBER 17.

Institute of Welding (Leeds branch):—"Welded Construction and the Drawing Office," by H. V. Hill. At the Technical College, Great Horton Road, Bradford, at 7 p.m.

Institute of Welding (West Scotland branch):—"Some Technical Problems in the Execution of 'Pluto,'" by J. S. Blair. At the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, C.2

OCTOBER 19.

Institution of Mechanical Engineers:—Presidential address by Prof. Andrew Robertson. At Storey's Gate, St. James's Park, London, S.W.1, at 5.30 p.m.

Keighley Association of Engineers:—Ladies' night. "Haworth and its Story," by Miss E. Hanson.

OCTOBER 20.

Institution of Mechanical Engineers (Graduates' Section):—"A System of Production Control," by R. Gore. At Storey's Gate, St. James's Park, London, S.W.1, at 3.30 p.m.

Keighley Association of Engineers:—Visit to Keighley Corporation Electricity Works.

OCTOBER 26.

Manchester Association of Engineers:—"Die Casting from the Engineer's Viewpoint," by M. R. Hinchcliffe. At the Engineers' Club, Albert Square, Manchester, at 6.45 p.m.

Institute of British Foundrymen

OCTOBER 13.

Scottish branch:—Presidential address by A. Marshall. "The Technological Principles of Casting Design," by Prof. V. M. Shestopal (to be read by D. H. Young). At the Royal Technical College, George Street, Glasgow, at 3 p.m.

West Riding of Yorkshire branch:—Presidential address by J. Timbrell. "Some Experiences with Large Castings," by J. Timbrell. At 1, Mannville Terrace, Bradford, at 5 p.m.

Burnley section:—"Uses of Gases in the Foundry," by H. Haynes. At the Technical School, Blackburn Road, Accrington, at 6.30 p.m.

OCTOBER 20.

Newcastle-upon-Tyne branch:—Presidential address by T. B. Burrows. Three short Papers on non-ferrous, cast iron, and cast steel respectively. At the Neville Hall, Westgate Road, Newcastle-upon-Tyne, at 6 p.m.

Lincoln section:—"Some Aspects of Modern Foundry Practice," by R. C. Shepherd. At the Technical College, Lincoln, at 2.45 p.m.

OCTOBER 22.

Sheffield branch:—Film entitled "Wheels Behind the Wheels," presented by the Universal Grinding Wheel Company, Limited. At the Royal Victoria Hotel, Sheffield, at 7 p.m.

OCTOBER 26.

Falkirk section:—"Running Systems for Light Engineering Castings," by R. R. Taylor and D. Fleming. At the Temperance Café, Lint Riggs, Falkirk, at 7 p.m.

OCTOBER 27.

Bristol and West of England branch:—"Duplex Pump Castings," by Brown and Dewhurst. At the Merchant Venturers' Technical College, Bristol, at 7 p.m.

East Midlands branch:—"The Quick Immersion Pyrometer in the Cast-iron Foundry," by R. C. Tucker. At Loughborough College, at 6 p.m.

OCTOBER 31.

London branch:—"The Application of Ethyl Silicate to Foundry Practice," by C. Shaw. Demonstrated by N. Shaw. Joint meeting with the Institute of Metals. At the Royal Institution, 121, Albemarle Street, London, W.1, at 7.30 p.m.

ASSOCIATION TECHNIQUE DE FONDERIE

PAPERS TO BE READ AT CONFERENCE

To the first post-war meeting of the Association Technique de Fonderie, to be held at their headquarters, 66 due Boissière, Paris (XVI^e), on October 19 and 20, the following Papers will be presented:—

"Notes on Progress made in American Foundry Practice," by J. S. Vanick (U.S.A. Exchange); "Control of Shrinkage Porosity in Castings," by W. A. Baker, B.Sc. (British Exchange); "The Martensitic Quench in Cast Iron," by G. Halbart (Belgian Exchange); "Researches on the Dispersion of Mechanical Tests on Cast Irons.—Applications to the Study of Mechanical Characteristics and the Influence of the Deoxidation of Pearlitic Cast Irons," by Dr. Paul Bastien and J. Prache; "Surface Hardening of Cast Iron by the Oxy-acetylene Torch," by E. Daynie; "Contribution to the Knowledge of the Electrochemical Corrosion of Cast Irons," by F. Girardet; "Fluxes and Slags in Metallurgy," by Dr. H. Lepp; "Synthetic Sands in the Magnesium Foundry," by M. Potemkine and M. Fieben; a Paper by M. Hérenguel; "Heated Special Alpax," by M. Castel; "Contribution to the Study of High Strength and High Electric Conductivity Sand-cast Copper-nickel-silicon Alloys," by M. Loiseau; "Portable Electric Dryers in Foundry Practice," by M. Manière; "New Testing Machines for Metals," by M. Ténot and M. de Paris; "Time Study Questions," by M. Dennery; and "Establishment of Schedules (Tables and Graphs) for the Determination of the Time to allow for Labour, Moulding, Coremaking and Fettling," by R. Salmet.

The conference is to be opened by Prof. Portevin (membre de l'Institut), whilst the closing speech will be made by M. Le Thomas, of the French Foundry Research Organisation.

STEEL CONTROL'S BIRMINGHAM OFFICES

The Ministry of Supply announce that the Drop Forging Sub-Control, the Birmingham Area Scrap Section of the Iron and Steel Control, and the Birmingham office of Iron & Steel Disposals, Limited, have ceased to operate from 263/265, Hagley Road, Edgbaston, Birmingham, 16. The Birmingham Area Scrap Section and the Birmingham office of Iron & Steel Disposals, Limited, now operate from 319, High Street, West Bromwich; and the Drop Forging Section from Ashorne Hill, near Leamington Spa.

PRODUCTION OF WHITEHEART MALLEABLE IRON BY ANNEALING IN PARTIALLY BURNT TOWN'S GAS*

Annealing time is reduced and difficulties of handling the ore are obviated

By I. JENKINS, M.Sc. (Member), and S. V. WILLIAMS, B.Sc.

(Communication from the staff of the research laboratories of the General Electric Company, Limited, Wembley)

(Continued from page 99.)

THE NATURE OF THE DECARBURISATION OF WHITE CAST IRON

Between 975 and 1,050 deg. C. white cast iron consists of a saturated solution of carbon in gamma iron, plus excess cementite. The decarburising gases in the annealing atmosphere react, at the surface, with the carbon in solution in the iron, with the result that the concentration of carbon falls below its saturation solubility in gamma iron. To maintain the saturation value at the surface, two processes come into play, namely the diffusion of carbon in solution from the body to the surface of the casting, and the solution of excess cementite at all points where the saturation solubility is not maintained. Since the process starts at the surface the excess cementite near to it is the first to go into solution, and as the annealing proceeds there is a gradual and uniform recession of the free cementite away from the surface. This is illustrated diagrammatically in Fig. 8.

The decarburisation of white cast iron therefore involves, at least initially, three processes, which are proceeding simultaneously. These are:—(*a*) Oxidation of carbon at the surface of the casting; (*b*) the diffusion of carbon to the surface, and (*c*) the solution of excess cementite. It is safe to assume that (*c*) the solution of excess cementite in unsaturated gamma iron is by far the most rapid, and thus does not control the rate of decarburisation. The relative rates of (*a*) and (*b*) are thus important in that the slower process governs the distribution of carbon in the iron. As will be seen from the photomicrographs (Figs. 1 and 6) in all cases the tendency is to produce a carbon-free rim. In other words the carbon is unable to diffuse sufficiently rapidly to the surface to maintain the minimum rate of oxidation or decarburisation, and being the slower process is the controlling factor in the decarburisation.

For such a case Ransley[3] has put forward the following equation.

$$K = \frac{W^2}{2C_0St}$$

where K = diffusivity constant (cm²/sec.),
W = the total weight of the element diffused per unit area of surface (grams/cm²).
C_0 = initial concentration of the element (grams./I.C.).
S = saturation solubility of the element at the temperature considered (grams/c.c.),
t = time of treatment in seconds.

Thus, for a given iron at a given temperature, $\frac{W^2}{t}$ should be constant. Table II gives the values for $\frac{W^2}{t}$ for two thicknesses of castings annealed at 975 to 1,050 deg. C. for various times.

It will be noted that $\frac{W^2}{t}$ tends to fall off with increasing time and temperature of anneal. At 975 deg. C. the factor is substantially constant for annealing times up to 20 hrs.; at 1,000 deg. C., up to 10 hrs.; and at 1,025 and 1,050 deg. C., the factor falls off after 5 hrs.

Simultaneously with the decarburising and diffusion process another, namely, graphitisation, is taking place in the iron. At the lower temperatures there is an interval, during the early stages of the anneal, before graphitisation is promoted, but this time interval decreases with increasing temperature. The interval during which there is no graphitisation corresponds to the initial phase during which the diffusion process complies with the parabolic law. As soon as graphitisation commences, however, the concentration and the rate of solution of carbon in gamma iron decreases, with the result that the factor $\frac{W^2}{t}$ falls off with time.

With increasing temperature the rate of diffusion also increases, with the result, as already pointed out, that the rate of decarburisation during the early stages of annealing also increases. However, the rate of graphitisation also increases with temperature and, once it commences, the rate of decarburisation falls appreciably. Thus, as shown in Fig. 5, after long annealing times, the total weight of carbon lost does not increase with temperature within the range 975 to 1,025 deg. C., because the increased diffusivity, and consequently the decarburisation is neutralised by the increased rate of graphitisation.

Above 1,025 deg. C., however, the increased solu-

* Paper read at the 42nd annual meeting of the Institute of British Foundrymen, held in London, June 15 and 16, 1945.

Production of Whiteheart Malleable Iron

bility of graphite in gamma iron, together with a probable increase in the rate of solution, results in an increase in the available carbon for diffusion and removal by oxidation at the surface. This probably accounts for the upward trend in the loss in weight-temperature curves at the higher temperatures, as shown in Fig. 5. The falling off in the values of $\frac{W^2}{t}$ with time is also not so marked at 1,050 deg. C. as at the lower temperatures.

of the decarburising gas over the surface of the castings. This condition can readily be satisfied when dealing with single samples on an experimental basis. On a practical scale, conditions may not appear so favourable, but it has been found that, with the use of specially designed containers which are substantially gas-tight and are provided with carefully located gas inlets and outlets which ensure a uniform distribution of the gas over all parts of the charge, rapid and satisfactory malleablising is obtained.

The higher the annealing temperature, the shorter is the annealing time, and consequently the greater the output from a given installation. On the other hand, from the point of view of the design, operation and life of the furnaces and annealing containers, the lower the annealing temperature the better. The annealing temperature is to a certain extent also governed by the size and shape of the castings in so far that thin sections, unless suitably supported, are liable to distort at the higher annealing temperatures. There is thus every incentive to operate commercial annealing furnaces at as low a temperature as possible consistent with rapid and satisfactory malleablising. Apart from very thin sections, satisfactory malleablising implies a graphitised core. Graphitisation is a

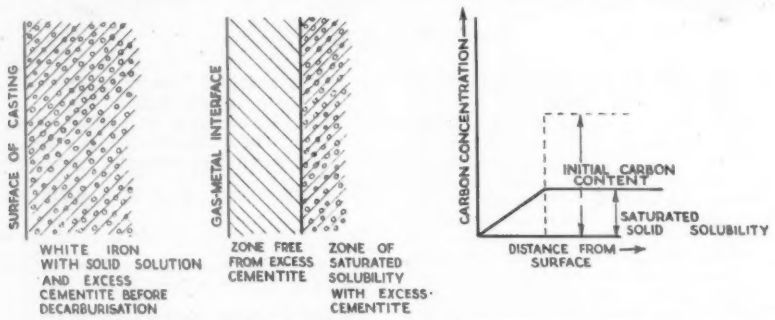

SURFACE OF CASTING
GAS-METAL INTERFACE
CARBON CONCENTRATION
INITIAL CARBON CONTENT
SATURATED SOLID SOLUBILITY
DISTANCE FROM SURFACE
WHITE IRON WITH SOLID SOLUTION AND EXCESS CEMENTITE BEFORE DECARBURISATION
ZONE FREE FROM EXCESS CEMENTITE
ZONE OF SATURATED SOLUBILITY WITH EXCESS CEMENTITE

FIG. 8.—DIAGRAMMATIC ILLUSTRATION OF RECESSION OF CARBIDE.

PRACTICAL APPLICATION

The experimental work discussed in the Paper shows that whiteheart malleable iron can be produced by annealing in partially burnt town's gas, which is cheap and readily produced. Under properly controlled conditions the annealing time is considerably less than that normally found necessary with the ore annealing process. The gas annealing process also has the advantage that all the difficulties associated with handling of the ore are obviated.

In order to maintain the maximum rate of decarburisation it is essential that there is an adequate flow

TABLE II.—*Relationship between the square of the loss in weight (W^2) and the time of anneal of white iron, decarburised in partially burnt town's gas.*

Time in Hours	$\frac{W^2}{t}$ for ½ in. thick samples				$\frac{W^2}{t}$ for ¼ in. thick samples			
	975 deg. C.	1000 deg. C.	1025 deg. C.	1050 deg. C.	975 deg. C.	1000 deg. C.	1025 deg. C.	1050 deg. C.
5	65·6	80·0	100	101·6	58·0	—	78·6	81
10	63·8	81·2	87	87·8	57·0	67·2	75·5	77·5
15	63·2	68·5	75·0	81·5	54·2	59·0	62·5	67·5
20	61·5	65·0	65·7	74·0	51·5	51·0	55·0	59·8
25	57·2	61·2	60·8	67·2	47·5	47·3	47·3	54·8
30	52·3	53·3	54·2	64·7	43·2	41·5	44·0	49·0
40	45·0	45·8	46·8	53·6	36·1	36·1	36·5	41·8
50	40·8	40·8	41·0	47·2	32·0	32·2	32·6	35·6

function of the composition of the iron, an increase in silicon content, for example, promoting graphitisation at a lower temperature. When considered in conjunction with the fact that the initial rate of decarburisation is not very different over the 975 to 1,050 deg. C. temperature range, there would appear to be some advantage in adjusting the composition of the iron, so that graphitisation of the core of the casting is complete in a reasonable time at the lower annealing temperatures. It is hoped to publish the results of work on this aspect of the problem at a later date.

Acknowledgment

The Authors desire to thank Mr. F. K. Neath and Mr. T. W. Harris, of Blakey's Boot Protectors, Limited, for kindly supplying the sample castings used in this investigation, and also for helpful discussions during the course of the work.

REFERENCE

[1] Ransley—J. Inst. Met., 65, No. 2, 1939, pp. 147–171.

APPENDIX

Town's Gas Burner

Town's gas burners are available with capacities ranging from 100 to 5,000 cub. ft. per hr. output. Designs vary in detail, but in principle they are substantially the same and a typical schematic arrangement is shown in Fig. 9. Fig. 10 shows a 1,000 cub. ft. per hr. town's gas burner. Fundamentally the burner consists of suitable means for delivering an accurately controlled air/gas mixture to a combustion chamber, where it is burnt under conditions which ensure complete removal of oxygen and elimination of hydrocarbons from the products of combustion. In order to ensure this the combustion chamber has to be maintained at a certain minimum temperature which is obtained from the heat of combustion of the gas.

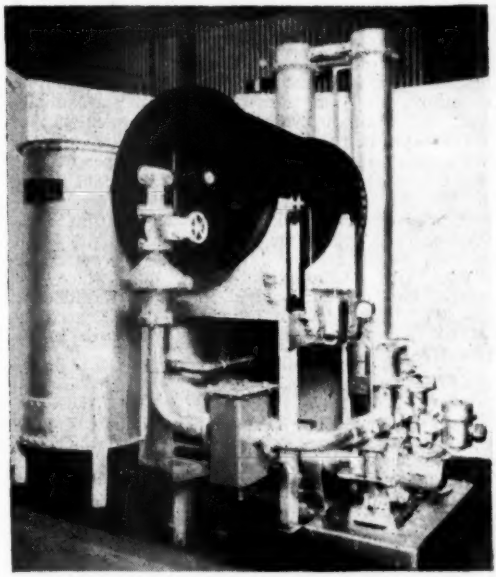
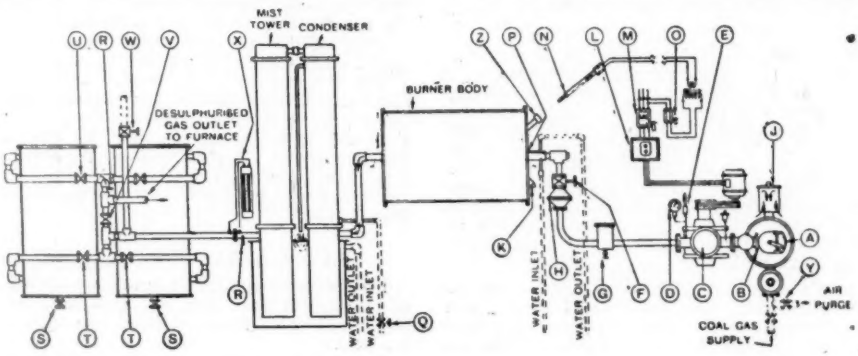


FIG. 10.—A 1,000 CUB. FT. PER HR. GAS BURNER.



A—Air-gas mixing control. B—Automatic gas-air mixer. C—Rotary compressor. D—Pressure gauge 0-100 in. w.g. E—Gas-pilot flame. F—Air-gas throttle valve. G—Drain-oil trap. H—Flame trap. J—Air filter. K—Burner sight glass. L—Compressor-contactor push button. M—Compressor-switch fuse. N—Electric igniter. O—Switch fuse for igniter. P—Burner nozzle. Q—Shut off valve-cooling water supply. R—Gas sampling cocks. S—Drains—ore beds. T—Ore bed inlet—change-over valves. U—Ore bed outlet—change-over valves. V—Ore beds by-pass valve. W—Waste pipe valve (starting up). X—Flowmeter. Y—Air purging line. Z—Sealing cap-igniter hole.

FIG. 9.—SCHEMATIC ARRANGEMENT OF TOWN'S GAS BURNER.

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There is also a maximum temperature for the combustion chamber if a reasonable life is to be obtained from the refractory lining, etc., of the chamber. These burnt satisfactorily in a burner chamber of certain fixed physical dimensions and shape. This means that considerations limit the volume of gas that can be the output from any particular plant is substantially fixed. Thus, although a plant with a nominal output of 1,000 cub. ft. per hr. of burnt gas can be operated over a range of, say, 800 to 1,200 cub. ft. per hr., the output cannot be varied from 0 to 1,000 cub. ft. per hr. For this reason it is advisable to use the appropriate size of burner with any particular furnace installation, and, where the demand for partially burnt gas may fluctuate from day to day, it is preferable to work with a number of small units which are brought into use as required, rather than with one large unit from which a proportion of the gas may not be required, and consequently will have to be blown to waste.

Reduction of Water Vapour Contents

From the combustion chamber the products of combustion pass to simple surface coolers in which the water vapour content of the gas is reduced to about 2.5 per cent. For many purposes—such as malleablising—further drying is unnecessary, but if necessary the water vapour content can be reduced to any desired value by means of silica gel or activated alumina dryers or by refrigeration. Drying units are not shown in the illustrations 9 and 10, which, however, do show desulphurising boxes. In this particular instance bog iron ore is used, but desulphurising is also done by means of activated carbon and by low-temperature treatment of the gas over certain catalysts.

For many heat-treatment applications desulphurisation of partially burnt town's gas is unnecessary, at least as far as any effect that the small amount of residual sulphur will have on the charge. On the other hand, the sulphur compounds may have a detrimental effect on the heat-resisting alloys used in the furnace construction, and from this point of view desulphurisation is often desirable if not essential. Similarly, when used for bright annealing of non-ferrous alloys and copper alloys in particular, complete removal of sulphur compound is essential if staining of the charge is to be avoided.

With town's gas of normal analysis, the burners are usually operated with an air/gas ratio of about 2 to 1 (complete combustion of town's gas requires a ratio of about 5 to 1). The volume of partially burnt gas delivered by the burner is approximately equal to that of the air used for combustion. Thus, a 1,000 cub. ft. per hr. burner working on a 2:1 air/gas ratio will consume 500 cub. ft. per hr. of raw gas. This has an important bearing on the cost of the burnt gas, which in most parts of the country works out at from 1s. to 1s. 6d. per 1,000 cub. ft.

SKIN PROTECTION FOR INDUSTRIAL WORKERS

A leaflet which was handed to our representative at the conclusion of a visit to the laboratories of Innoxa (England), Limited, 233-241, Balls Pond Road, London, N.1, outlines the properties of a number of creams designed to give protection to the hands of industrial workers. The specific problem posed by our representative was: "By the use of a preparation, could a moulder after a hard day's work in an ironfoundry leave the shop with hands as clean as an office worker?" As no coal dust carrying moulding sand was available, a member of the Innoxa staff applied a preparation to his hands, then covered them with powdered graphite—which is several degrees worse than coal dust—and finally achieved complete cleanliness by merely dipping his hands in lukewarm water.

If this system is commercially applicable—and there is every reason to believe that it is, especially as the cost is extremely modest—then there is no reason why foundry dirt should be carried into the homes of iron moulders. Moreover, though it was the Innoxa Company which drew our attention to this subject, we learn that there are other makes of protective creams available.

MANCHESTER ASSOCIATION OF ENGINEERS

The students' section of the Manchester Association of Engineers, which has been held in abeyance during the war, is to recommence activities during the coming session. It has been decided to broaden the scope of the section by opening it to the widest possible range of junior engineering personnel, including trade apprentices who are attending day or evening technical classes. The age range for the section is 17 to 25 years and the Council will recommend to the next annual general meeting of the Association that the subscription rate of the section be reduced from 10s. to 4s. 6d. per year.

The first meeting of the section will be held at the Engineers' Club, Albert Square, Manchester, on October 17, at 7 p.m., when the main functions of the section will be explained, a committee elected and the programme for the remainder of the session worked out. The following two films will also be shown:—"The Valley of the Tennessee" and the British Council film on steel.

B.C.I.R.A. ELECTS NEW MEMBERS

The following companies have been elected members of the British Cast Iron Research Association. The names of the representatives are given between brackets.

AS ORDINARY MEMBERS.—African Malleable Foundries, Limited, Johannesburg, Transvaal (Mr. R. N. B. Norris); R. Buchanan & Sons, Limited, Christchurch, New Zealand (Mr. C. G. Buchanan); and Mansons, Limited, Glasgow (Mr. Colin Hampson).

AS TRADE MEMBER:—Industrial Newspapers, Limited, London (Mr. V. C. Faulkner).

JOINT IRON COUNCIL

FIRST ANNUAL CONVENTION

Many distinguished guests attended the luncheon which preceded the first annual convention, on September 28, of the Joint Iron Council, which, formed in the early part of this year, comprises the Council of Iron Producers and the Council of Ironfoundry Associations. It is an autonomous body formed to negotiate with Government departments on all matters affecting the foundry iron and ironfoundry trades, to protect the interests of the joint industry and to stimulate its development. The president of the Joint Iron Council, Mr. H. H. Berresford, J.P., presided over the gathering, which was held at the Dorchester Hotel, Park Lane, London, W.1.

Two Ministers who had hoped to attend the luncheon were Sir Stafford Cripps (President of the Board of Trade) and Mr. John Wilmot (Minister of Supply). Unfortunately, however, Sir Stafford had had to travel to Lancashire, and Mr. Wilmot was making a protracted tour of the country; their sincere regrets were tendered to the gathering.

MR. T. CHADWICK (chairman of the National Union of Foundry Workers) said he was well qualified to propose the toast of the iron industry, having worked in the foundry from the age of 14 years until, in 1912, he became officially connected with the union which he still serves. In the course of his remarks he referred to the changes which had occurred in the foundry industry since he had first become connected with it. When he had entered the industry, the moulders' craft was thought to be one of the foremost in the foundry. Mechanisation, which had developed to a very large degree, had created changes, not only in regard to the manner of doing the work, but also as affecting the evolution of the industry. Having seen it through all those phases, he could claim to be something of an expert with regard to foundries, and more particularly foundry practice. With such experience one came to realise that we were at the dawn of a new day so far as the foundries were concerned. There was more consideration to-day, on the ground of the need for improvement, than there had been for some time, and all concerned must play their part.

Co-operation Between Employers and Employed

Both the employers and the employed were concerned with problems of man-power and the conditions in the foundries, and in the future a greater degree of co-operation was necessary between them than had applied in the past. The matter that concerned him was how far they could achieve that spirit of co-operation, of give-and-take. Mr. Chadwick had some idea at least that there was a change of heart taking place even with trades union officials; and he felt certain, from his contacts with certain of the employers, that there was a repentance among them. He hoped that that spirit of repentance would lead to a greater unifying force in the interests of trade as a whole throughout the country, and particularly so in the foundry industry. In wishing the Joint Iron Council well, he hoped the employers would wish the employees well, and would listen to them in a spirit which would tend to bring all interests more closely together. He coupled with the toast the name of Mr. Berresford, the president of the Joint Iron Council.

A Complex Industry

The PRESIDENT, responding, expressed indebtedness to Mr. Chadwick for his broad-minded and statesmanlike utterance. He had no doubt that the 200-odd gentlemen present at the luncheon, whom one gathered from Mr. Chadwick's remarks were attired in hair shirts, would ponder very seriously those remarks.

The members of the Joint Iron Council, the president continued, appreciated very much the attendance of their guests, for the occasion was a baptismal ceremony. It was its first annual convention, and it was a very great honour to him to have been selected to preside. They were making history in the creation of the Council; for the first time in the annuals of the industry the producer and the consumer of iron were fused into one whole. It might be said that still the development did not go far enough, that they should have brought in the consumers of the ultimate or end products. Bearing in mind, however, the variety of products made by the industry, to have included the consumers of the ultimate products would have meant co-opting representatives of the 40-odd millions of people in this country, if they were all to have adequate and equitable representation. By welding together the producers and users of iron into one body, they considered they had achieved a very desirable end, and an end which was in the national interest.

He was anxious that there should not be misconception about that. It had been alleged a little while ago that the movement was one of those old dodges to exploit the consumer. He emphasised, therefore, that the Council was not a price-fixing body. There was equal representation of the producers of foundry iron and the various associations representing the users of foundry iron; the executive comprised 10 from each. Great care had been taken to leave the autonomy of the membership associations absolutely uninterfered with and untouched. He emphasised that the formation of the Council was not an attempt to find the lowest common denominator, *i.e.*, the least efficient, and to build around it an organisation to fleece the public in order to make it possible for the lowest form of life to exist; that was not the intention at all.

Indeed, the intentions were entirely in the contrary direction. He was grateful for Mr. Chadwick's advice, which was so apt at the moment, after the holocaust through which we had all passed, that there was the greatest need, not only for the general public to be alert and scientifically minded; in order to overtake the years the locusts had eaten, co-operation between

Joint Iron Council

management and labour was not only desirable, but imperative. Without it we should achieve nothing: they must convince all classes who contributed to the well-being of industry that that well-being could not be achieved unless they all pulled together. They could not take more from the pool than they jointly put into it; the days when manna rained down from heaven had gone by.

Thus, so far from exploiting the consumer in order to prolong their own wretched existence, the members of the Joint Iron Council had in mind, by collaboration and co-ordination within the industry, to foster progress and develop a competitive position, which not only would benefit the industry, but would be of advantage to the nation as a whole. Most important of all, it must not be forgotten that they comprised, not merely a home or national industry, but one which must look forward to regaining and maintaining our export trade, without which our country and Empire would go the way of so many dynasties of the past.

Co-operation with the Steel Interests

The presence of some of his good friends in the British Iron and Steel Federation led Mr. Berresford to say that the Joint Iron Council was in no sense promoted in any spirit of antagonism or of opposition to its larger brother, the Federation. The members of the Council felt that the foundry iron and ironfoundry interests were of such magnitude and had their own specific and domestic problems to consider that the formation of the Council meant a logical sub-division of labour; they felt it would save a great deal of overlapping and confusion, in that they would not be wasting the steel industry's time, and at the same time would not be meddling with the steel industry's problems which were quite outside the iron industry's scope. The iron industry employed over 100,000 people and, subject to the fluctuating values, it had a turnover of anything from 120 to 150 million pounds sterling per annum; it was a great national industry, covering a wide variety of products which entered into innumerable interests in life, extending from boot protectors to the largest engine castings; it affected every branch of domestic life, as well as engineering, shipbuilding, and so on. Indeed, it was difficult to conceive how the national well-being could be sustained at all without the efforts of the iron industry, including the foundries. Consequently it was felt that, not only as a matter of logic, but also from the point of view of magnitude, the Council had justified its existence and had quite enough to do to look after the industry's own affairs and to set its house in order.

At the same time, there were many points of contact which it hoped to cultivate with its friends, the British Iron and Steel Federation, on matters common to both—taxation, transport, design and operation, raw materials, and so on—and they would not be disappointed in looking forward to that co-operation and collaboration on matters of common interest which were so vital to both.

Commenting further on the versatility of the iron industry, he said its record during the dreary years of war was something of which to be proud. It had contributed a great deal to the winning of the war. As just one instance of its adaptability and capacity, he mentioned its work in connection with the production of track links. The foundry industry had made a very great success of that work and had helped very largely to make possible the landing of our armies in Normandy. The pig-iron producers had also contributed very largely in turning over from the production of foundry iron to basic iron, which was not its normal trade; without over-calling his hand, he ventured to think that its operations in producing the basic iron would stand comparison with those of the normal producers of basic iron. He was informed that, notwithstanding a 40 per cent. cut in personnel, to allow its men to fight the country's battles, the industry had maintained an average output of 2½ million tons per annum during the war years, which was no mean achievement.

Research

But the Joint Iron Council was not content merely to hold a watching brief. The natural resources of some other manufacturing countries exceeded our own; but that was no reason why we should not make the best use of the facilities at our disposal. We were not going to bury our talents in the earth; what we had we should develop to the *n*th degree. One of the chief things to which we as a nation, and not merely the iron industry, must bend our attention was that, starting off as we did from a back mark, by reason of the nature of our physical resources, we must see to it that we were just one step ahead of competitors in scientific attainment and in research. Whatever we lacked in the way of natural advantages, we must endeavour to make up in application, industry, enterprise and brains. One of the main reasons for the formation of the Joint Iron Council was to pool brains, carry research to the highest degree and perfect the tools we had. The Council was not unmindful of the need for education in the industry; it wanted to educate, to produce, it wanted a trainee system, it wanted to improve the amenities of the industry, to raise its status and its conditions, as well as the quality of its products.

The Industrial Set-up

MR. FITZHERBERT WRIGHT (vice-president of the Joint Iron Council), proposing the toast of "The Guests," endeavoured to paint a word picture of what he visualised to be the new industrial set-up in this country. A good foundryman, he said, was always an artist. When an artist set out to paint a picture, he must have a framework; and Mr. FitzHerbert Wright visualised the country as the framework of the picture which he sought to paint. It might be a bit cracked in certain respects, he said, but it was still a very sound piece of work.

Next, the artist required canvas, brushes, paint, etc.; and the canvas must be coated with some preparation. In the past the artist had had to use preparation A; but nowadays he had available preparation **B**, by

which the speaker meant that we had available to-day a very much better educated population than ever before, so that the preparation which was used previously would not do for the present, and, therefore, it must be altered. Then the artist needed a background for his picture, and that background was provided by the Government, which gave guidance in regard to the industrial set-up in this country and in negotiations with other countries. Thus was the opportunity provided to pay tribute to the guests who were representative of the Government—Prof. Franks, Mr. J. C. Carr, Mr. Tom Makemson, Mr. C. R. Wheeler and Mr. Norman Iles.

Next, the artist must put something further into the picture which would have an effect on his central object; that reference led Mr. FitzHerbert Wright to Sir John Duncanson, representing the steel industry, whom he welcomed cordially. Undoubtedly there were industries with which the Joint Iron Council would co-operate closely, and the Council would be delighted to work with the steel industry on matters of common interest; from experience of working with Sir John, Mr. FitzHerbert Wright said that, although they did not always agree, they had always remained firm friends.

The technical and the daily Press had also a big part to play in the balance of the complete picture. He believed the general public did not fully appreciate the importance of the iron industry. It was the very basis of the whole of our national economy, and he hoped that, with the aid of the Press, the public would become rather more iron industry conscious.

Of the guests who were representative of those concerned with the technical advancement of the industry he mentioned particularly Mr. J. W. Gardom, president of the Institute of British Foundrymen, a most honourable and excellent organisation which had done excellent work during the war. Mr. Gardom's happy knack of getting things done had contributed a great deal to the proper application of the results of research work conducted by the British Cast Iron Research Association, under the guidance of its able Director, Mr. J. G. Pearce. It was regretted that Mr. Pearce was not present; but he was in Germany, acquiring more information on behalf of the industry. Then there were Mr. T. Chadwick and Mr. J. Gardner, who were also of great importance, representing those who had to do the hard graft.

The central theme of the picture was a very ordinary milk-maid's stool, supported on three legs, which meant that it was extremely stable. If any one of those legs were longer or shorter than the others, the stool was of no use. The legs were representative of those who worked with their heads, those who worked with their hands, and those who provided the capital in order that the two former could work; and they must all have an equal share in the responsibility of the industry.

He believed that the stock of this country at the moment was higher than it had ever been in the history of the world; we had an unlimited opportunity to lead, not only in practical things, but also in spiritual things. The ball was at our feet; we must get together and kick it, and we should achieve that full employment we all wanted in order to place our country and Empire far ahead of anything in this world.

Co-operation Assured

SIR JOHN DUNCANSON, responding on behalf of the guests, wished great success to the Joint Iron Council in the future. The present time, he said, was one in which we were called upon to take stock. We had just come through the most terrible time that this universe had ever had to face, a time when the pace of destruction was great and terrifying. Nevertheless, our souls had not been destroyed; indeed, Mr. Chadwick's remarks indicated his belief that our souls were greater than ever before. The ray of hope for the future was in the way in which we should use those souls.

Emphasising the necessity for co-operation, Sir John said that many of the problems of the iron and the steel industries were common to the whole of British industry; discussion amongst them was imperative, particularly amongst industries that were kindred. Therefore, he welcomed Mr. Berresford's remarks concerning the intentions of the Joint Iron Council in that respect and, representing British iron and steel, returned the pledge of friendship and co-operation; he looked forward to a long and close co-operation with Mr. Berresford and his colleagues. He felt that the formation of the Joint Iron Council expressed the desires of its members for co-operation and goodwill.

OUTPUT OF COPPER AND COPPER-ALLOY PRODUCTS

The following figures show the United Kingdom output of the main copper and copper-alloy products in the first and second quarters of 1945:—

Unalloyed Copper Products—High-conductivity rods and strip, first quarter, 34,910 tons, second quarter, 34,365 tons; rods and sections, 1,553 and 1,390 tons; strip and sheet, 7,951 and 8,450 tons; tubes, 8,371 and 6,875 tons; castings, 2,500 and 2,500 tons.

Brass and Other Copper Alloy Products.—Wire, first quarter, 3,143 tons, second quarter, 2,895 tons; rods and sections, 39,058 and 36,714 tons; strip and sheet, 44,968 and 37,173 tons; tubes, 3,503 and 3,571 tons; castings, 19,935 and 18,113 tons.

Copper Sulphate.—13,468 tons in the first quarter and 14,362 tons in the second quarter.

The total for all products was 179,360 tons in the first quarter and 166,408 tons in the second quarter, the copper content being 134,048 and 124,117 tons respectively.

U.K. CONSUMPTION OF ZINC

United Kingdom consumption of new and scrap zinc during the first half of 1945 was as follows:—

Brass, 34,335 tons in the first quarter and 30,613 tons in the second quarter; galvanising, 10,771 and 11,208 tons; rolled zinc, 5,939 and 5,988 tons; zinc oxide, 8,224 and 7,325 tons; zinc alloy die-casting, 6,074 and 5,469 tons; zinc dust, 2,134 and 1,289 tons; miscellaneous uses, 2,883 and 2,870 tons.

The totals for all trades were 70,360 and 64,762 tons, made up of:—New zinc, 45,411 and 43,109 tons; scrap (including re-melted) zinc, 24,949 and 21,653 tons.

STEEL PRODUCTION SINCE 1939

HIGH ANNUAL AVERAGE

It is now possible to indicate in a concrete manner the achievements of the British steel industry during the period since 1939, when, it will be recalled, all statistics relating to production were withheld on security grounds.

Home production of steel ingots during the five war years (1940-1944), it may now be stated, averaged 12,700,000 tons. This was considerably above the highest rate achieved over any considerable pre-war period. In the four years immediately preceding the war (the best peacetime run of comparable duration) average production was 11,300,000 tons a year. The main difficulty in securing high production during the war period was—not to mention the blackout—the loss of the richer imported ores. Their replacement by lower grade home ores greatly reduced the output from blast furnaces and the quantity of hot metal available for steelmaking.

In the latter part of the war reductions were necessary in transport of raw materials for the steel industry, particularly in connection with preparations for D-Day and the Continental operations. There were also shortages of coal and, to a lesser extent, of labour which made it necessary to continue operations at around the 12,000,000-ton level, compared with the rate of 13,000,000 which represented about the maximum that could have been achieved with the class of raw material available under war conditions.

Comparative Tonnages

The following table summarises the supply and consumption of steel during the war period:—

Period	000 tons (ingot equivalent).				
	Home production.	Imports.	Total deliveries.	Export.	Home deliveries.
Average of 4 peacetime years, 1935-38	11,257	1,244	12,482	2,438	10,044
1940	12,975	3,356	15,231	1,286	13,945
1941	12,312	13,658	14,564	526	14,038
1942	12,942	2,407	15,956	274	15,682
1943	13,031	2,773	16,005	122	15,883
1944	12,142	1,668	14,328	240	14,088
1945 .. .. (Based on first half.)	11,970	190	12,960	360	12,600
Average of 5 war years, 1940-44	12,680	2,772	15,216	489	14,727

The very large expansion of steel deliveries to home users during the war period was made possible partly by the increased availability of steel overall, but also by the drastic curtailment of steel exports to a very small quantity which was sent out for essential war purposes. The increase in home deliveries from an average of 10,000,000 tons in the four pre-war years to an average of 14,700,000 tons in the war period represents nearly a 50 per cent. increase.

To an important extent this understates the true increase, since a much greater proportion of the total in the war period was accounted for by alloy and highly-specialised steel products involving greater furnace and rolling mill capacity, as well as more labour, in its production. If the use of steel is measured on a value basis, assuming constant prices throughout the whole period, the increase in the value of steel used would be approximately double that pre-war. This increase gives a truer indication of the contribution made by the steel industry to the war effort than taking the crude tonnage figures.

Figures for 1945 have been included in the table based on the results for the first half-year only. It will be seen that ingot production is not likely to exceed the 12,000,000 ton level for the year. Imports also are down to a very low figure. In the first half of the year there has been a much greater consumption of imported steel than there have been new arrivals, so that stocks have been run down and are now close on the minimum working level.

New estimates of requirements of steel following the termination of the Japanese war have not yet been completed. Whatever temporary interruptions in demand there may be due to the cancellation of war contracts, it appears clear that, taking a rather longer view, British ingot production is most unlikely to meet the total requirements, particularly with a large export demand.

Every effort will be required to increase home production. Even so it appears necessary to secure imports, particularly in a semi-finished form which can be processed and converted into more highly finished export products, and thus make the fullest possible use of the normal balance of the industry in the United Kingdom with its excess of finishing over ingot capacity.

EXPORTS OF NON-FERROUS METALS

Exports of unwrought copper, which have been negligible since 1941, rose in the first half of this year to more than half the 1938 figure, and, according to Board of Trade figures, almost the whole of the exports this year went to France. Exports of nickel were almost 2,000 tons higher, owing to special shipments to Russia, while an increase of 4,000 tons for tin was shared between France and Canada.

Exports of Metal and Metal Manufactures.

	Value.	Quantity.		
	Half-year 1938.	Half-year 1938.	First six months. 1944.	1945.
	£ mill.	Th	ousand c	wts.
Brass and brass manufactures	1.1	216	63	72
Copper and copper manufactures	1.0	324	60	141
Nickel, unwrought	1.1	123	7	45
Tin blocks, etc.	1.2	123	28	108

SYLLABUSES of the 1946 examinations for admission to the Institute of Marine Engineers, copies of the previous Papers, and particulars of exempting qualifications may be obtained on application to Mr. B. C. Curling, secretary, 85, Minories, London, E.C.3.

HIGH TENSILE STEEL FOR CASTINGS

By W. WEST, C. C. HODGSON and H. O. WARING

Discussion on a Paper read before the Lancashire branch of the Institute of British Foundrymen, the president (Mr. Stanley Brooks) being in the chair. The Paper was printed in our issues of September 20 and 27, and October 4.

Vote of Thanks

MR. N. JACKSON, in proposing a vote of thanks to the Authors, said they should be supported when stressing the necessity of exercising care with regard to the production of steel castings. Mr. Hodgson had touched upon one aspect of the matter which was vital as far as engineering was concerned, namely, the relationship between the test-bar figures. Without intending in any way to be libellous he thought it was correct to state that the light alloy section of the industry had misled the aircraft people in quoting figures for test-pieces, which, in many cases, were double those which occurred in castings. Certain specifications called for 18 to 20 tons, and if 12 tons was got from a casting the result was good.

The importance of the removal of hydrogen during the oxidation period of steel making had been mentioned, and Mr. Hodgson had stated he found it desirable to reduce the carbon to a low figure. That was also his own experience. He had found also that the rate of carbon removal was important; in other words it was desirable to get the carbon down to 0.1 per cent. or 0.15 per cent.

Temperature measurement was another important point in the control of steel casting manfacture. Had Mr. Hodgson seen the latest indicating machine which Tinsley Industrial Instruments had produced? This was an instrument which made a record on a chart by means of a large finger which everybody could see.

MR. HODGSON said the instrument was used at Farington foundries in conjunction with a recorder.

MR. DUTTON seconded the motion, which was carried by acclamation.

MR. WEST, in responding, said that as far as steel castings were concerned, physical results obtained from test-bars were within reasonable limits of those obtained from castings. It was to be assumed from Mr. Jackson's reference to light alloys that he referred to specifications such as DTD304 which gave 18 to 20 tons tensile. RR50 would give 10 to 11 tons tensile, though this alloy gave much difficulty in the early stages of the war, but now that founders thoroughly appreciated the art of melting and not losing titanium, magnesium, the castings gave results reasonably comparative to those obtained from the test-bars.

He had had the opportunity of comparing British practice with that of the American and found that in dealing with large quantities on a mass-production basis, similar troubles were experienced in the United States of America to those met with in this country. He felt that the British steel foundry was not in any way behind the American counterpart in regard to founding technique.

DISCUSSION

MR. MENZIES, referring to the presence of hydrogen in cast steels, said the Authors had referred to it being incorporated by moist fragments in the material, but he did not mention the ferro-manganese, which held quite a substantial quantity. Personally he had experienced trouble from ferro-manganese, but had eliminated it by heating the alloy to red heat before use. He noticed that the analyses given in the Paper were all of high manganese steels, so there must have been a fair proportion of manganese addition. Then he noticed the dry compression strength of the sands reached 300 lbs. What put it up as high as that?

MR. WARING could not say very much concerning the rate of carbon removal affecting the amount of hydrogen left in the steel, or whether it was effective in completely removing hydrogen from the steel. In his opinion, it all depended upon the carbon removal occurring at such a rate that the steel was made to "boil." By prolonging the boil it should be possible to eliminate most of the hydrogen previously dissolved in the steel. The duration of the boil at a given rate was important. The carbon could be removed down to 0.1 per cent. by putting in a large amount of ore, but if the temperature was kept down there would not be a very vigorous boil, and by the time the first sample was taken it would be found that the bath was about 0.1 per cent. carbon. This state of affairs did obtain with occasional heats. His practice was to put half the ore in as soon as a bath was formed, and the remainder when the steel was more or less completely melted. Then as the temperature increased it was found a vigorous boil would result, and shortly afterwards the carbon would be down to about 0.1 per cent. Therefore, the practice had to be standardised. It could not be stated that all the hydrogen was removed because there were no means available of ascertaining what was left in the bath, but there were no flakes in the steel.

He had not any experience of oxidising very high carbon charges at a really good vigorous boil, but he did try always to get a fairly vigorous boil just before slagging off. It had been found that a good boil did at any rate eliminate flakes and did not seem to have any bad effect on the steel.

Ferro-manganese did contain hydrogen and perhaps some other gaseous elements, but so far he had not tried pre-heating it, though some people had done so. In one particular case 120 lbs. of ferro-manganese was put in a 3½-ton heat in order to get 1.5 per cent. of manganese in the finished steel. Nothing was done with it except to put it in as it was received, but it should not be visibly wet. There were but few heats with a reduced ductility, which might be ascribed to flakes, invisible to the unaided eye.

The dry compression figures for moulding sand could be taken as accurate, as they were derived from a compound lever machine, which could be loaded much better than some of the machines on the market which were actuated by an oil pump or ram. It was usually tested out against the tensile testing machine, but it could be tested against a spring balance, or a spring,

High Tensile Steel for Castings

of which the load and deflection properties were known. Actually 200 to 300 lbs. per sq. in. was not a very high value for steel moulding sand, and there would be trouble in the foundry if the strength dropped below 100 lbs. per sq. in.

Some of the dry sand-testing machines in use would produce figures on the A.F.A. specimen varying from 100 to 300 lbs. per sq. in. on the same sample of sand. With the machine he used, if the specimens were made with reasonable care, figures could be obtained within 10 lbs. or 20 lbs. per sq. in. He had seen figures for dry strength of steel sand published in the Press, which had caused him to wonder as to their reliability.

Vigorous Boil and Residual Gases

MR. J. HILL also referred to the rate of carbon removal during the boil and the nature of the boil. He was convinced that the published data on steel-making foundries did not emphasise sufficiently the necessity for securing a violent boil in a bath during the oxidation period, especially from the point of view of hydrogen and carbon monoxide inclusions. To make a satisfactory clean steel to be cast in green sand moulds, it was desirable to melt with a bath of about 0.354 carbon, and introduce ore which would reduce this amount to 0.1 carbon in 10 to 15 min. What was Mr. Hodgson's view concerning this?

He had had some experience with regard to hydrogen, and of the appearance of small pinholes in green sand steel castings. This defect was removed by inducing a sufficiently high vigorous boil to ensure that the majority of the hydrogen and carbon monoxide was removed from the metal.

It was essential in good electric steel practice in the foundry to have control of oxidising conditions rather than melt with a low carbon and have a sluggish boil. He did not think there was sufficient emphasis placed upon this point in the published data on steel making. Another point he wished to mention was in connection with the columnar crystal effect in high tensile steels. He had noticed that in the "as-cast" condition there was an adverse effect if a columnar condition was clearly apparent.

Boiling Conditions Reviewed

MR. WARING agreed that the literature on the practice of steel making contained much conflicting information. Some liked to melt the steel completely first, then add the iron ore and then boil out. Some put it in at the beginning, some half way through, and so on. He did not consider it satisfactory practice to melt the steel first, make the bath hot, and then begin to boil out the carbon. When he mentioned the vigorous boil he did not mean the sort of thing that caused slag to come out through the doors; he meant the sort of boil that could be seen in the furnace, having the form of plenty of bubbles. This kind of boil could be obtained by being very careful with the temperature and the iron-ore additions, but it required skill to do it, because the boil could be going on correctly; and then all at once it might increase suddenly and slag would come out through the doors.

The carbon could be boiled out from 0.4 to 0.1 in 10 to 15 min. This was the most appropriate time to do the boiling out provided the steel was boiling steadily. To start with 0.4 per cent. and try to get down to 0.1 in 10 to 15 min. would involve the addition of a large amount of iron ore, which would chill the bath considerably, and there would have to be a wait of 10 to 15 min. to get the steel hot again. Further than this he could not express any opinion on the rate of carbon removal on those lines.

The best way of dealing with higher carbon steel charges was to put at least half the ore in as soon as a bath was obtained. Part of the carbon was thereby removed before there were any signs of boiling or even before the whole charge was melted. It would be found that as the temperature increased there would be a satisfactory boil which quickly reduced the amount of carbon remaining.

With regard to the columnar crystals it appeared to be generally agreed that that form of crystallisation in a large casting would weaken the steel more in its passage through the liquid to solid cooling range. Columnar crystals usually indicated slow cooling. This circumstance allowed cores more time to break down, but in another way it could be detrimental because the steel cooled more slowly and allowed more time for hot tears to form. The steel would be in a pasty condition much longer.

In the case of a casting with, say, badly designed sections, where there were sharp corners, and so on, that particular type of crystallisation was not desirable because it left a plane of considerable weakness which could not be destroyed very well even by high temperature annealing; it always remained.

Speed of Steel Making and Quality

Mr. West had noticed that in the United States foundrymen congratulated themselves upon the fact that they could melt, boil and finish a 10-ton heat in two hours. Personally he would prefer an extra 1½ hours' time to improve the steel, than adopt such fast steel-making methods which were not favourable to quality production.

MR. HILL, speaking with reference to allowing sufficient time for refining, said he had not referred to quick carbon removal in respect to making heats of steel rapidly, but more from the point of view of the removal of gases. The trouble occurring from dissolved carbon monoxide was nothing like as serious as that resulting from taking a slow boil through a longer period. He had not been referring to producing steel quickly in mass quantities.

Sand Permeability

MR. WARING, referring to the idea that hydrogen could be absorbed from the green sand, said it could be agreed that the more the steel was degasified the more likely it would be to take up hydrogen. Steel would only take up hydrogen when it was hot, and it gave it up below 300 deg. C. on cooling. Pinholing in steel castings was more likely to be due

to low sand permeability. With very open sand in green sand work there was nothing like the same degree of pinholing. There was a rush of gas as the steel entered the mould, and it had to be evacuated by having a fairly open sand. There was no doubt that water vapour was produced in the mould as the steel went in, and the temperature was sufficiently high to decompose it into hydrogen and oxygen. The steel might then combine with the hydrogen and give it up at a lower temperature. In practice, steel did not contain sufficient hydrogen to produce the evolution of this gas in bubble form, and the effects of hydrogen in this connection would probably be more closely associated with those of carbon monoxide, namely, the reactions involving soluble oxide with hydrogen. He did not know how the presence of residual oxygen in the steel could affect the amount of hydrogen taken up at that stage. Larger blowholes could be formed by there being too much residual oxygen in the steel, which would combine with carbon and hydrogen under certain conditions. Blowholes from this source were usually formed immediately below the skin.

Situation Summarised

MR. HILL said that in the particular instance he had in mind the permeability of the sand was approximately 175; therefore the pinholes were not a consequence of permeability. He thought they were due to melting with a low carbon bath, the formation of an excess of ferrous oxide beneath the electrodes, by the steel becoming saturated with carbon monoxide, and the boil not being sufficiently vigorous to remove all the carbon monoxide.

MR. WARING said that Mr. Hill had mentioned a point which was necessary to be emphasised, namely, that steel was very much better for having been vigorously boiled in the furnace before being taken in the ladle for casting. He had had no practical experience that boiling the steel vigorously in the furnace would make any difference to the result of green-sand castings, although he had seen a published statement to that effect. Apparently the point to be borne in mind was that steel was more likely to contain more gas if it had not been boiled, because the boiling action removed gas by molecular attraction. When gases were formed in the nascent state in steel they appeared as tiny bubbles which could not become freed owing to the surface tension of the steel.

When big bubbles were formed small ones diffused into them and were carried away with them. Therefore the statement appeared to be correct that it was beneficial to insist on the steel boil. If the iron ore was put in early enough there was a slow approach to equilibrium at the slagging off stage, and this would seem to be better than dosing a hot placid bath and forcing a chemical reaction to take place which was not likely to approach near to equilibrium before slagging off. There had been experience of heats which had not boiled even although the carbon had been reduced to the desired figure; the carbon had gone out so slowly that the steel had not boiled in the usual sense of the term. The bubbles must have escaped from the steel, but they had been much smaller. In

(*Continued at foot of next column.*)

U.S. TIN SUPPLIES

MOVES TO SECURE MORE METAL

Moves to increase the limited supply of tin in the United States and, if possible, to speed the start of the flow of the metal to expedite reconversion, have been announced in Washington by Mr. J. A. Krug, chairman of the U.S. War Production Board.

Mr. William L. Batt, a member of the Combined Raw Materials Board, has just returned from Europe, where he conferred with British and Netherlands authorities on what can be done to start and speed the production of tin. Both the British and Netherlands Governments are sending missions to the Far East in the near future to make a study of conditions in liberated tin-producing countries. Mr. Robert P. Patterson, Under-Secretary of War, has cabled the commanding generals in both the China theatre and the South-East Asia Command requesting an immediate survey of available quantities of several materials in very short supply, including tin, and careful estimates as to how quickly and in what quantities these can be ready for shipping. Meanwhile, the American Government is making every effort to expedite the delivery of tin-producing equipment, which has been asked for by the Netherlands Government.

In addition to these specific developments, every effort is being made by the Foreign Economic Administration to maintain, and if possible to increase, the supply of tin from sources developed during the war. The end of the war has not increased the amount of tin available, but rather it has increased the number of claimants for the already meagre world supplies. Europe needs tin for reconstruction. Therefore, the prospects are none too bright until Far Eastern tin production gets into its stride.

When the United Nations lost access to the tin from Malaya and the Netherlands East Indies in 1941, total American stocks of pig-tin, secondary tin and concentrates were at their highest mark—157,227 tons. Since then these stocks of tin have dwindled steadily. During 1944, consumption of tin in America was 89,500 tons, approximately 9,000 tons greater than in 1943, and even exceeding the consumption in 1942. For the first six months of 1945 consumption was at an even greater rate. So far, the effects of cancellation of contracts since VE-Day have been of a minor nature.

HIGH TENSILE STEEL FOR CASTINGS

(*Continued from previous column.*)

such a case the pinholing might be due to the escape of gases remaining in the steel.

MR. HODGSON added that much of the discussion had been devoted to the subject of the oxidation period and the removal of hydrogen, but the importance of the refining period and its influence on the production of molten steel from which to produce castings free from pinholes and similar defects could not be too strongly stressed. In this particular respect the refining period was, in his opinion, of far more importance than the oxidising period.

NOTES FROM THE BRANCHES

LONDON BRANCH.—The new session was opened on October 3 by a visit to the magnesium foundry of J. Stone & Company, Limited, Deptford, London, S.E.14. About 100 members participated and, after being divided into small parties, were conducted through the patternshop, chemical, physical and the very extensive X-ray departments, melting, mechanised and loose pattern moulding shops, and the heavy and light coremaking and heat-treatment departments. Constructed since the war, these exceptionally well-ventilated shops rank high in the scale of modern mechanised foundry practice, both as to equipment and layout. After tea in the canteen, Mr. A. J. Murphy, the new president, presented Mr. P. T. Holligan with the Institute's diploma for a Paper he read before the branch on modern bearing alloys. Following this, Mr. Frank Cree, one of the oldest members of the Institute, presented Mr. V. C. Faulkner, the retiring honorary secretary and past-president of the Institute, with a draft on a prominent London stamp dealer for the acquisition of philatelic material. This had been subscribed to by the members of the branch as distinct from the officers, who had already made their own presentation. Mr. Faulkner, in thanking Mr. Cree and the members, characterised the presentation as unique, as it was the second occasion on which his work as honorary secretary had been recognised. On the former occasion, in 1923, when he presided over the branch, there was a recognition that he had raised the membership from a problematic 50 to 150; this time the gain had been from 300 to 500.

Mr. Murphy then delivered his presidential address, which took the form of an informal description of a recent visit to Germany. He emphasised that such tours at the moment are the reverse of "joy trips," and travelling by jeep could be considered a luxury. More often than not quite long journeys were taken in lorries. Of the foundries he visited, he found that in general the equipment and processes were not in advance of British practice. For light alloys, the Germans were still using sand and not shot blast on technical grounds. One outstanding job was the making as a die casting of Diesel engine casings for submarines. This was the largest die casting he had ever seen. One factor noted was the pronounced ignorance of German executives of the work undertaken by their colleagues. Another was how the impact of the R.A.F. bombing associated with poor arithmetic influenced production. When the war started, the Germans were using magnesium wheels for artillery; later, when they found that this metal was all needed for aircraft, they changed over to steel. Attacks on the Ruhr caused this material to be changed to aluminium. Again, foundries located more than 100 miles away from the Ruhr found themselves without gas for melting, as either the pipeline or production plant had been destroyed. The president expressed his gratitude to the authorities of the American army zone for their co-operation.

Mr. G. R. Webster (vice-president) proposed, and Mr. G. C. Pierce seconded, a vote of thanks to Mr. Murphy for his address; to the directors of J. Stone & Company, Limited, for their hospitality; and to those members of the staff who had so kindly and efficiently acted as guides. This having been cordially endorsed by the members, the meeting was adjourned.

SCIENTIFIC CIVIL SERVICE

A White Paper presented to Parliament by the Chancellor of the Exchequer announces a complete reorganisation of the Scientific Civil Service, with improvement of salaries and careers. At the highest levels there will be salaries of £2,250 and £2,500, with two or three posts, in the whole Civil Service, at £3,000. The salary of the Permanent Secretary to the Department of Scientific and Industrial Research becomes £3,500. There will also be an experimental officer class, which is to replace the present scientific assistant class. This class is to be recruited partly from boys and girls aged 18-19 who have specialised in scientific subjects, and partly from university graduates and from persons with experience in industry and engineering. Salaries will range from £150 on recruitment at age 18 (with arrangements for higher starting salaries for older recruits) to £800. All these figures are subject to bonus addition, at present £60 for men. Provision will be made for the promotion of experimental officers to be scientific officers. The White Paper states that the Government are resolved that the conditions of service for scientists working for the Government shall be such as to attract into the Civil Service scientifically qualified men and women of high calibre, and to enable them after entry to make the best use of their abilities, in order that scientists in the Government service may play their full part in the development of the nation's resources and the promotion of the nation's wellbeing.

GERMAN PLANT AS REPARATIONS

A message from Weisbaden states that five big German industrial undertakings in the American occupation zone will be made available for reparations to the United Nations. They are the underground power plant of Gross-Draftwerk-Mannheim, at Mannheim, formerly used to generate electrical power for a large area; the Bremen Deschemag-Wesser shipyard at Bremen; the Kugelfischer Georg Schaffer Company at Schweinfurt, Bavaria, makers of anti-friction bearings; the Bayerische Motorwerke Plant No. 2 in Munich, one of the largest aero-engine plants in Germany; and the underground aeroplane and truck engine parts plant at Nockarelz, near Heidelberg. The message states that it has not yet been decided to which nations the dismantled plant will be assigned as reparations, but work is to begin immediately.

B.C.I.R.A. "BULLETIN" INDEX

With the issue of the September edition of the "Bulletin" of the British Cast Iron Research Association, there was enclosed an index to Vol. 6, that is, of material which appeared between July, 1939, and April, 1942.

THIRTY YEARS AGO AND TO-DAY

MR. F. DUNLEAVY REVIEWS PROGRESS IN FOUNDRY PRACTICE

The East Midlands branch of the Institute of British Foundrymen opened their 1945-46 session last month with a visit to the Stanton Ironworks Company, Limited, near Nottingham, by kind permission of the directors. Mr. P. H. Wilson, O.B.E., vice-president of the Institute, received 140 guests on behalf of his company. The visitors were conducted through the Stanton Gate Foundry by competent guides, the whole cycle of operations from the receipt of raw materials to the passing to the machine shop of the fettled casting being fully explained. An illustrated description of the plant appeared in our issues of October 7 and 14, 1943.

At the conclusion of the tour of the foundry, the visitors were entertained to a film exhibition showing the plant in operation, which effectively demonstrated the capabilities of the layout.

After tea had been served, Mr. F. Dunleavy, branch-president, expressed the thanks of the branch for the opportunity granted for inspecting the Stanton Gate Foundry, and to the guides for the very able manner in which they had conducted the visitors round the plant. Mr. J. W. Gardom, president of the Institute, supporting Mr. Dunleavy, said, in his opinion, the ideal way to inspect a foundry was when it was not working. Stanton had gone one better; they had coupled with the inspection a film showing the plant in operation. Was this the trend for future foundry visits? It had been a most instructive and enjoyable visit, and he was delighted to have been invited to attend.

The vote of thanks was heartily accorded. Mr. F. Scopes, managing director, and Mr. P. H. Wilson suitably replied.

Presidential Address

MR. DUNLEAVY was then formally installed in the presidential chair by Mr. Butters, past-president, and gave the following address:—I am old enough to have had 30 years in the industry, and still young enough to remember my early days. At first glance one does not notice differences, because they are so gradual; yet immense changes have taken place. The tallow candle has been replaced by the mercury vapour lamp; the fettling shop, where every casting was brushed by hand, now houses modern equipment; the sand and plaster oddsides have given place to power moulding machines; the laborious handling of sand is now undertaken by the conveyor and the hopper feed; loam sand cores have practically disappeared and are now oil sand; and the "one-off mind" of the moulder of yesterday has been changed to the "quantity mind."

The influence of quantity production has caused a complete revolution in outlook; isolation and prejudice have given way to co-operation with other departments; the old hit-and-miss methods have been replaced by control of all possible variables; and, providing the progressive ideas are continued, the future of the foundry is assured, for castings still remain the shortest cut between raw material and the finished product.

The evils of the industrial revolutions have been much sifted, and often whitewashed, but I do not think it an exaggeration to say that working conditions in our foundries of 30 years ago were reminiscent of the more publicised state of affairs in the mining and clothing trades. Dim, inefficient lighting, primitive manufacturing methods, obsolete tackle, rule of thumb, and rigid prejudices, made the foundry the "cinderella" which we resent hearing about to-day. The passing of the tallow candle and paraffin lamp for illumination, and the ability to walk the shop without needing a mental map of the layout of the tackle, which inevitably littered the floor, have typified the improvements, traceable in every branch and subsection of the art of founding.

I would like to register personal appreciation of this change. Our industry is no longer a "cinderella," but a progressive community, ready to exploit fully the wide opportunities which the coming years will offer.

The Starting Point

The foundry I knew 30 years ago had changed little in the previous half-century. Moulding methods, though often ingenious, were slow and laborious, dependent on the skill and initiative of the individual moulder for their success. Undoubtedly many sound and intricate castings left the shops of that time, and they represented the true triumph of the craftsman over difficulties. There was no control as we know it to-day, and foundrymen were averse to intruders in their own chosen sphere of operations. There was no real knowledge of the causes underlying foundry scrap, and laboriously gained experience of the successful moulder was jealously guarded, while each apprentice was left to travel alone the same arduous road to success.

Breaking Down Staff Jobs

In those days the foundry staff were jacks of all foundry occupations—none the worse individually for that, but necessarily lacking the specialisation and co-ordination, which was already becoming apparent in other engineering industries. As the years have passed it has been shown that no single feature was responsible for the foundry's difficulty in making the pace; all aspects of foundry technique suffered from ignorance and, although for years metal quality seemed the obvious thing to control, when such control was instituted, without similar attention to moulding details and materials, it was like putting a modern V8 engine into a 1914 model T Ford chassis, and so for 30 years our aim has been to pour the correct metal into the perfect mould, often enough to satisfy production needs and give reasonable production costs.

To further this end, pattern equipment has come in for drastic revision and overhaul. The patternshop has had to make patterns which could be easily moulded in the foundry. If it did not previously exist, standardisation and co-operation between the two departments have been forced upon them. Coreboxes

Thirty Years Ago and To-day

have had to give cores that do not need rubbing to avoid a crush, and the jigging of assembly cores has gauged their accuracy before clay thickness or a scrapper have proved their inaccuracy. Designer and foundryman have slowly come to realise their interdependence, and mutual co-operation has displaced mutual distrust and antagonism, at least to a large extent.

The planning department, and the exponents of foundry loading schemes may be considered as nuisances, but they have shouldered a share of the responsibility for satisfying machine-shop and customers' requirements, and provide a well-informed liaison between supply and demand. The metallurgist has come to stay. Metal composition and quality, sand control, and the technical aspects of our industry have received specialist attention, and the metallurgist is no longer just a convenient peg on which to hang the responsibility for a goodly portion of scrap castings.

Modern Conditions

Mechanisation has relieved the industry of much drudgery, incredibly speeded up its processes, and in so doing raised new problems in its wake. A conveyor is not so sympathetic as a moulder's shovel, and the increased quantities to be handled have made it essential to study mould handling, as distinct from mould manufacture, in order to cut out human labour when it presents a bottleneck to machine production. Similarly, metal distribution has discarded the hand shank for the monorail, and miniature singly-operated ladle. Dietert records that a particular foundry produced 100 tons of castings per day, and the labour costs of sand handling and working were 22 times those of metal preparation and distribution. No wonder mechanisation is with us! The cupola, mechanically charged with weighed fuel, flux and metal, has dispensed with much of the need for experienced furnace operatives, but 30 years of investigation has not yet fully solved the reasons underlying the variations in cupola products. Many technical and practical Papers have testified to the obstinacy of this problem.

Working conditions have not received in this discourse the mention of immense progress common to other foundry sections. We all feel that too many foundries still lovingly cling to their gloom and dirt. However, the modern newly built shops are pointing the way we shall all follow in the future. The ideal, described in a Paper on American foundries, with its white-tiled walls continually water sprayed, dust extractors and hooded knockouts, underground sand return system and complete mechanisation, may be impracticable in many of our branches of founding—I cannot imagine a loam bay on heavy work in such surroundings—but the idea is sound and desirable, and only needs modification to suit circumstances. We already know that this lack is largely responsible for the present dearth of enthusiastic apprentices.

Between the wars, advertisements for foundry managers used to specify the need for "wide experience in green-sand, dry-sand and machine moulding; some metallurgical knowledge, accustomed to estimating, costing and rate fixing; strict disciplinarian, etc.; age under 30." What a man! Nowadays about six departments do his job, and the future, I am convinced, will see the heads of these departments able to meet and discuss foundry problems from the same angle and employing mutually understood terms, those of the scientific application of technical and practical knowledge. As yet we are still in our water-tight compartments, but foundry problems affect all branches of the foundry staff and design to such an extent that complete co-ordination between the specialists will be an essential feature of their solution, and a more general sympathy with foundry difficulties will result.

The Future

The future must hold the solution to our unsolved difficulties and more efficient operation, and I know that these meetings of the branches of the Institute unite, if only for a brief period, the long train of foundry executives and technicians, whilst they consider together some foundry subject and pool their various items of knowledge. Finally, our industry has enthusiasm in its personnel, technical and mechanical efficiency in its processes, and organisation behind its ability to produce what the world needs. Castings are still the shortest cut between raw materials and finished products. The past 30 years of progress has proved our ability to profit from this, and the future will see us even more capable of making the casting supply an essential need in civilisation's requirements.

On the proposition of Mr. Bunting, seconded by Mr. Buckland, a cordial vote of thanks was passed to the president, who, after an acknowledgment, closed the meeting.

INTERNATIONAL MEEHANITE CONFERENCE

A conference of foremen and metallurgists from all the Meehanite licensee foundries in Great Britain was held recently at Derby, under the auspices of the International Meehanite Research Institute. Nearly 50 representatives were present, the meeting being opened by Mr. E. M. Currie, of the International Meehanite Metal Company, Limited.

The entire session was devoted to practical foundry technique, and full and frank discussions ranged over many subjects, including gating and risering practice, feeder core risers, foundry machinery, core and mould sand preparation and testing, physical testing and test-bar practice, inspection methods and defective castings elimination.

The Butterley Company, Limited, presented a film detailing the many activities of the firm and a visit, by kind permission of the directors, was paid by the entire conference to their works at Ripley.

THE AMERICAN FOUNDRYMEN'S ASSOCIATION is forming a committee to report on a "Recommended Practice for Centrifugal Castings."

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NEWS IN BRIEF

SUFFOLK IRON FOUNDRY (1920), LIMITED, of Stowmarket, has attained its Silver Jubilee.

CAST IRON SUPPLIES, LIMITED, announce that their address is now Evelyn House, 62, Oxford Street, London, W.1.

JOHN HASTIE & COMPANY, LIMITED, Kilbain Engine Works, Greenock, engineers and ironfounders, have now reached their centenary.

DIES, CASTINGS, PLASTICS, LIMITED, is being wound up voluntarily. Mr. R. E. Clark, 17, Albion Street, Hanley, Stoke-on-Trent, is the liquidator.

MR. P. W. DUNN, of London, has been awarded the Institution Prize by the Junior Institution of Engineers for his Paper on "Recuperative and Regenerative Furnaces."

THE GOVERNMENT have accepted a proposal from the Council of Industrial Design to hold in the summer of next year a national exhibition of design in all the main ranges of consumer goods.

THE BRITISH MALLEABLE TUBE FITTINGS ASSOCIATION have returned from the country, and their offices are now situated at 196, Shaftesbury Avenue, London, W.C.2. The secretary is Mr. F. B. Ridgwell, to whom correspondence should be addressed.

BRITAIN WILL SEND 17,000 tons of steel to Norway for her shipbuilding programme by June of next year, according to an agency message from Oslo. A Norwegian delegation back in Oslo from Britain and the United States also arranged for 47,000 tons of steel from the United States by the end of this year.

THE ANNUAL REPORT of Peter Brotherhood, Limited, states that the company has on its books a large number of orders, including air compressors for Diesel-driven vessels, steam and water turbines for export, brewery machinery, textile machinery, refrigeration machinery and general structural work, which are now being taken in hand.

B. & S. MASSEY, LIMITED, of Openshaw, Manchester, manufacturers of smithy, forge and drop-stamping plant, advise us that their London office is now situated at Fenchurch House, 5, Fenchurch Street, E.C.3. The office at 88, Fenchurch Street has been closed. Their London representative, Mr. G. M. Turnbull, who, during the war, has conducted business from Newbury, has returned to London.

AT THE ANNUAL MEETING of the Sheepbridge Coal & Iron Company, Limited, Sir Henry Stephenson, the chairman, disclosed that during the war their shops at Sheepbridge works supplied 3,218,000 shot and shell of various sizes, ranging from six-pounders to 15 in.; 215,000 bombs, ranging from 100 to 4,000 lbs., of an aggregate weight of 53,450 tons; 1,437,000 shell forgings for 25-lb. and 3.7-in. shells; 1,260 depth charge throwers; and over 100,000 aircraft components. In addition, the output of their normal products from the blast furnaces and rolling mills was fully maintained.

AFTER HAVING BEEN REDUCED to a minimum during the last stages of the war, the movement of iron ore from the Swedish Lapland mines has recently begun to increase, according to the Swedish journal "Affärsvärlden." During July railway traffic was more than doubled to 201,000 tons, the bulk of which was sent to the port of Narvik. The repair of the quay works in Narvik is being followed with interest, the journal says, and adds: "It may be anticipated that in the future, exports *via* Narvik will be of greater importance compared with Lulea than has previously been the case."

THE TREASURY have made an Order under Section 20 of the Finance (No. 2) Act, 1940, entitled "The Purchase Tax (Alteration of Rates) (No. 3) Order, 1945," the effect of which is to reduce to 16⅔ per cent. of the wholesale value the rate of purchase tax chargeable on copper hollow-ware of a kind used for domestic purposes (other than fancy or ornamental articles). The reduced rate applies only to goods which are delivered on sale, or appropriated to retail trade or similar purposes, on or after October 3, or, in the case of imported goods, which are entered with the Customs or delivered from bonded warehouse for home consumption as the case may be, on or after October 3.

STEEL TO BE MADE IN EIRE

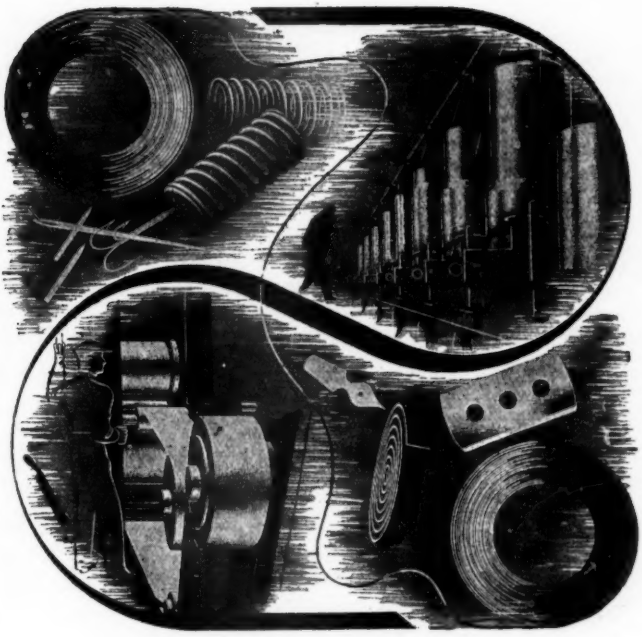
At the annual meeting of Irish Steel, Limited, held in Dublin, Mr. Vincent Crowley, the chairman, said that about £26,000 had been spent during the year on the erection of open-hearth furnaces and auxiliary plant. A large quantity of steel scrap had been purchased, and further substantial quantities were available, but it had been found impossible to purchase pig-iron. To overcome this difficulty, a cupola had been built for manufacturing suitable pig-iron from selected scrap. Manufacture of steel in the open-hearth furnace required trained technicians, he said, and they were not available in Eire at the moment. It was hoped to start manufacturing as soon as the men were available. Meanwhile, they were re-rolling purchased billets. A further 4,000 tons of billets had been recently secured in Canada, but the cost was high.

OBITUARY

MR. ALFRED A. CHARLES, director of the Rother Boiler Company, Limited, Rotherham, has died at Kimberworth, Yorkshire. He was 75.

MR. NORMAN WEATHERLEY, a director and sales manager of Raine & Company, Limited, iron and steel manufacturers, of Gateshead, has died following a short illness. He was 47.

MR. H. M. LANE, whose death is reported from Detroit, at the age of 77, was well known as a consulting engineer for foundry projects. Amongst his best-known European installations was the original mechanisation of the Citroen foundry in Paris. He participated in the 1945 Manchester conference of the Institute of British Foundrymen and made a noteworthy contribution to a discussion on coremaking.



Design by Victor Reingânum

MOSAICS OF STEEL

NUMBER EIGHT

Samuel Fox produced the first cold rolled steel strip in 1854, having twelve years earlier established his works for the drawing of high grade wire. The products of this pioneer work now serve every kind of industry. Serving the present needs of aircraft and other mechanisms requiring reliability, they will once more be released for the production of the strip and wire required by the manufacturers of a wide variety of products, from razor blades, pen-nibs, fish hooks, clocks, radiograms, furniture and decoration, to typewriters and sewing machines and cycles and toys. Cold rolled steel strip and fine steel wire are to be found in many articles of ordinary life, in innumerable domestic, industrial and scientific applications.

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PERSONAL

MR. J. G. W. PAWLYN has joined the board of Ransomes, Sims & Jefferies, Limited.

SIR ANDREW DUNCAN has rejoined the board of Imperial Chemical Industries, Limited.

MR. J. N. BURNS, who has been spending his first leave since the war in London, returns to Karabuk, Turkey, shortly.

SIR MILES THOMAS has been elected chairman of the Council of the Federation of Chambers of Commerce of the British Empire, in succession to Sir Arthur Alton.

COL. WALTER MACFARLANE, head of Walter Macfarlane & Company, Limited, Saracen Foundry, Glasgow, has been nominated Deacon-Convener of the Trades House of Glasgow.

MR. G. W. LACEY has relinquished his appointment as Controller of Light Metals in order to rejoin the British Aluminium Company, Limited. He is succeeded by MR. C. G. MCAULIFFE.

LIEUT.-GEN. SIR WILFRID LINDSELL has been placed by Sir Stafford Cripps, President of the Board of Trade, in charge of the supervision of the change-over of United Kingdom factories from wartime to peacetime production. He has already taken up his new duties.

MR. T. H. ANDERSON, of Manchester, has been appointed planning engineer, and MR. W. B. THOMAS, also of Manchester, costing engineer, of the North-East Engineering Bureau, which was formed early this year to help in the development of the light engineering industry.

MR. ARNOLD TIPPER, M.Sc., has joined the staff of the Harborough Construction Company, Limited, Market Harborough, Leicestershire, as general manager of the foundry supply department. To do this he has relinquished his position as research and development engineer at the Birmingham Aluminium Casting (1903) Company, Limited.

MR. OLIVER LYTTELTON, M.P., has been appointed chairman of Associated Electrical Industries, Limited, in succession to SIR FELIX J. C. POLE, who has resigned owing to eye trouble. Sir Felix, who had been chairman since 1929, will remain on the board, and has been appointed deputy-chairman. Mr. Lyttelton was Minister of Production in the National Government.

MAJOR-GENERAL READMAN has been appointed a special director of the English Steel Corporation, Limited, to assist the managing director in the administration of the works at Openshaw, Dinting Vale and Holme Lane. He also will be in charge of the sales organisation, covering the Corporation's small tool and tool steel business and forgings and castings produced at Openshaw.

MR. F. JACKSON has been appointed refractory and crucible sales representative for Lancashire, Yorkshire and Cheshire of the Carborundum Company, Limited, Manchester. A past-president of the Bristol and West of England branch of the Institute of British Foundrymen, Mr. Jackson enjoys the foundry experience accumulated over more than 30 years and has been active in the teaching of elementary metallurgy and foundry practice.

MR. W. K. B. MARSHALL, B.Eng., of the Aluminium Plant & Vessel Company, Limited, received the Sir William J. Larke medal and award for 1945 at a meeting of the Institute of Welding, held at the Institution of Civil Engineers, Great George Street, Westminster, London, S.W.1, on October 3. The prize-winning Paper was "The Fabrication of Aircraft Fuel Tanks in Aluminium Alloy Containing 3 per cent Magnesium." The presidents of the Belgian, French and Dutch welding societies were present at the meeting.

MR. W. M. INMAN, formerly sales controller of Imperial Chemical Industries, Limited, has been appointed chairman of the Alkali Division in place of Mr. J. L. S. Steel. MR. E. M. FRASER, lately Director-General of Aircraft Production, has returned to I.C.I. as sales controller in place of Mr. W. M. Inman. MR. A. T. S. ZEALLEY has been appointed chairman of the Billingham Division and MR. V. ST. J. KILLERY, from Billingham, to be chairman of the General Chemicals Division. MR. S. A. H. WHETMORE has been appointed managing director to the Billingham Division jointly with Mr. K. Gordon.

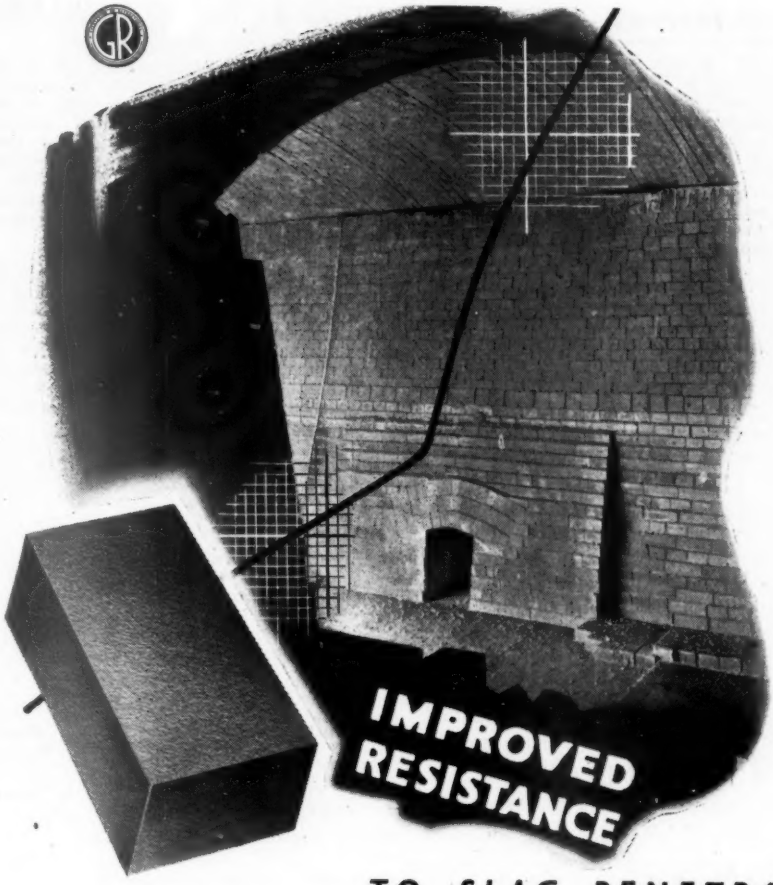
IRON TRADE EMPLOYERS' INSURANCE ASSOCIATION

At an extraordinary general meeting of members of the Iron Trades Employers' Insurance Association, Limited, special resolutions amending the Memorandum and Articles of Association were carried, by virtue of which authority was taken to establish a subsidiary company with power to transact all classes of insurance business. The decision to transact new classes of insurance business through the medium of a subsidiary company was made only after extensive consideration and upon the best legal advice. This procedure will ensure that the funds of the Association are protected for the purpose of liquidating all liabilities. Under the amended Articles of Association members retain their rights to share in any ultimate distribution of surplus funds made by the parent company.

The new company will be wholly owned by, and under the direction of, the parent company, which will remain active for the purpose of workmen's compensation business and the liquidation of its liabilities.

INSTITUTION OF METALLURGISTS

The Institution of Metallurgists has been registered as a company without share capital. Its objects are to promote and study the science of metallurgy and the status and prestige of metallurgists. It will collaborate with the Iron and Steel Institute, the Institute of Metals and similar organisations. The institution is to be an examining body. The number of members is unlimited, each being liable for £1 in the event of winding up. Members are classified as "Fellows" and "Associates," and other classes may also be formed.



TO SLAG PENETRATION

SLAG penetration of refractory materials normally accompanied by erosion, surface spalling, shrinkage, etc., is frequently responsible for the ultimate failure of refractories. To reduce the destructive effect of slag penetration, volume-stable, dense, low-porosity, low-permeability bricks, with the correct chemical composition, must be used. A characteristic of G.R. products is that they possess these necessary qualities and thus ensure minimum slag penetration. The services of G.R. engineers are available on request, to users, on the choice and application of refractories.

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Raw Material Markets

IRON AND STEEL

Apart from the growing emphasis on the need for an increased output of high-phosphorus iron for the light-castings trade, there are no new trends in the market for pig-iron. Blast-furnace men are getting better supplies of foreign ores, but will need to be assured of bigger tonnages of coke before more furnaces can be put into operation. Ampler tonnages of hematite are now obtainable and licensed quantities of low-phosphorus and refined irons can be readily provided.

There is clear evidence of a substantial gap between the maximum power output of steel semis and the requirements of the re-rollers. This, of course, was expected when the Control purchased substantial tonnages from the Dominions, but the first deliveries have not yet arrived and in the meantime the supply position is very tight. Deliveries of steel bars are barely adequate and still more marked is the shortage of square and flat billets, which has given a further impetus to the demand for defectives and, in fact, any class of material which can be used in the bar and section mills.

The plate mills enter upon the fourth period with substantial rolling programmes in which the lighter sizes preponderate. Rollers of sheets, too, are bombarded with inquiries and January next is probably the earliest delivery date which can be promised to buyers seeking to place additional contracts. There is, however, no indication of any early expansion of interest in heavy constructional material, and recent export orders have been too limited in weight to provide full employment in this department. Railway requirements have attained substantial proportions and collieries have already placed business to cover their needs to the end of the year.

NON-FERROUS METALS

The latest official estimate of tin stocks found in Malaya is 17,000 tons. During the war years, U.S consumption of tin has shown a gradual upward trend, according to figures published in the report of the War Production Board, and the authorities are still concerned about the level of supplies. American tin imports for the first half of 1945 totalled 20,982 tons, compared with 40,875 tons for the corresponding period of last year.

There is a brisk demand in the home market for lead, arising from the requirements of the prospective housing programme. The United States exported 15,523 tons of pig-lead during 1944, including 14,315 tons to Russia. Consumption of copper and zinc is on a fair scale, but increases rather slowly.

Activity in scrap is practically non-existent despite the fact that manufacturers are well stocked.

DURING THE WAR, the steel foundry of Edgar Allen & Company, Limited, made nearly 20,000 tons of steel castings.

INDUSTRY IN THE DEVELOPMENT AREAS

The appointment is announced of a committee which is to advise the Treasury in giving financial assistance to industry. The Committee, to be known as the Development Areas Treasury Advisory Committee, has been appointed under the Distribution of Industry Act, 1945. The members will be: Sir Nigel L. Campbell (chairman), Mr. Arthur Deakin, Mr. Edward de Stein, Mr. William L. Tregoning, Mr. George Wansbrough and Sir Cecil M. Weir, with Mr. Hyman (of the Treasury) as secretary.

The work of the committee will be to examine applications and to make recommendations for financial assistance to be given by the Treasury to industrial undertakings, established or to be established in a development area, to enable such undertakings to raise necessary capital. Applications for assistance cannot be entertained unless the undertaking has already been approved by the Board of Trade as complying with the proper distribution of industry, states the Treasury.

Sir Nigel Campbell is joint deputy-chairman of Stewarts and Lloyds, Limited. He is chairman of the Nuffield Trust for the Special Areas. Mr. Edward de Stein is a director of the Industrial & Commercial Finance Corporation, Limited. Mr. George Wansbrough is chairman of A. Reyrolle & Company, Limited, and Mr. William L. Tregoning is a director of the Bynea Steel Works, Limited, and of John S. Tregoning & Company, Limited.

Sir Cecil Weir is Director-General of Equipment and Stores, Ministry of Supply. Mr. Arthur Deakin is a member of the T.U.C. Council.

NEW COMPANIES

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Fluxio Tool Company, 210, Watsons Road, Blackpool—£4,000. J. C. Taylor and G. Battye.

Hogan Engineering, 3, St. James Square, Manchester, 2—£3,000. J. Hogan and J. Dalton.

Engineering (Bolton), Triangle Works, Back Darwin Street, Bolton. £500. H. and I. E. Trimble.

Eclipse Metal Industries—£1,000. W. M. Wright, 200, Wolverhampton Street, Dudley, subscriber.

Brickhouse Heat Appliances, 33, Gt. Charles Street, Birmingham, 3—£1,000. R. A. E. Godfrey and W. N. Camp.

Penkridge Engineering Company, Victoria Street, Hednesford, Staffs—£2,000. C. E. Ives and W. C. Stewart.

Aintree Welding Company, 1, Ormskirk Road, Liverpool—£1,000. E. M. Houghton, J. B. Boosie, and A. Jackson.

Fenton-Dore—Ironfounders, engineers, etc. £3,000. C. I. Greenway, 128, Baslow Road, Totley, Sheffield, subscriber.